Noise Impact Assessment Report

Roundwood School Site, Boxley

Kent County Council Property Group

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1.0 INTRODUCTION

1.1.1 ENVIRON UK Limited has been commissioned by the Kent County Council Property Group to measure and assess the impact of noise in respect of land referred to as the 'Roundwood School site' in Boxley, for residential development.

1.1.2 Maidstone Borough Council, hereafter referred to as MBC, has been consulted in order to ensure that the appropriate noise criteria for the development are achieved in line with both national and local guidance.

1.1.3 An environmental noise survey has been undertaken at the site in order to determine the existing ambient noise levels across the site, the results of which has been used as the basis for this assessment. This report does not consider the potential noise impact the proposed development will have on existing sensitive receptors in the vicinity.

1.1.4 The former school site has been assessed for its suitability for residential development based on current land uses, i.e. as it will be prior to construction works commencing. Where measured noise levels indicate that noise may need to be a determining factor in the granting of planning permission, generic mitigation measures have been proposed to ensure satisfactory internal noise conditions are met.

1.1.5 This report contains references of a technical nature, a glossary of acoustic terminology has therefore been provided in Technical Appendix A to assist in any interpretation.

2.0 ASSESSMENT METHODOLOGY

2.1.1 Following consultation with MBC, Planning Policy Guidance Note 24 (PPG 24)[1] has been used to determine the suitability of the site for the proposed residential development.

2.1.2 PPG 24 sets out four Noise Exposure Category (NEC) bands, designed to assist local planning authorities in evaluating applications for residential development with respect to the existing noise climate.

2.1.3 Table1 below shows each NEC band, defined by a range of 'free-field' noise levels into which development land falls. The table relates to 'mixed noise sources' as the site is affected by both road and rail traffic noise and therefore this is considered the most relevant source of noise for this site.

TABLE 1: NOISE LEVELS CORRESPONDING TO NEC'S FOR NEW DWELLINGS, $L_{Aeq,T}$ dB

Noise Source	*Time Period*	*Noise Exposure Category (NEC)*			
		A	*B*	*C*	*D*
Road Traffic	0700 – 2300	<55	55 – 63	63 – 72	>72
	2300 – 0700	<45	45 – 57	57 – 66	>66
Additionally, during night-time (2300 – 0700), sites where individual noise events exceed 82 dB L_{Amax} (slow time weighting) more than twice in any hour during this period should be treated as being in NEC C, regardless of the $L_{Aeq,8h}$ (except where the $L_{Aeq,8h}$ already puts the site in NEC D)					

2.1.4 The relevant planning advice to the local authority with respect to each NEC is presented in Table 2 below.

[1] Planning Policy Guidance Note 24 (1994), Planning and noise, Department of the Environment.

TABLE 2: PLANNING ADVICE CORRESPONDING TO NEC'S FOR NEW DWELLINGS	
NEC	***Advice to Local Planning Authority***
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as desirable.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise. For proposed development subject to the high end of the category a Noise Impact Assessment will assist authorities in identifying appropriate noise mitigation measures.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should generally be refused.

2.1.5 Where the advice within PPG 24 is that conditions should be imposed to ensure a commensurate level of protection against noise, mitigation measures are required to either reduce noise at the location to an acceptable level or control its impact.

2.1.6 Where measurements indicate that noise cannot be reduced to an acceptable level with the windows open, PPG 24 states that '*because noise should be taken into consideration when determining planning applications in NEC B, it has been assumed that the minimum amelioration measure available to an occupant will be to close windows'*, and reference is made to other standards that establish suitable internal noise levels, such as BS 8233 *Sound insulation and noise reduction for buildings – Code of Practice* [2] and the WHO *Guidelines for Community Noise*[3].

2.1.7 The scope of BS 8233 is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate.

2.1.8 The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings. It suggests that an internal noise level of 30dB $L_{Aeq,T}$ within bedrooms is a 'good' standard, whilst 35dB $L_{Aeq,T}$ is a 'reasonable' standard. For living areas in the daytime, the standard recommends 30dB $L_{Aeq,T}$ as a 'good' standard and 40dB $L_{Aeq,T}$ as

[2] British Standard 8223 (1999): Sound insulation and noise reduction for buildings – Code of Practice. British Standards Institute.
[3] World Health Organisation (1999): Guidelines for Community Noise. WHO

being a 'reasonable' standard. BS 8233 also states that individual noise events should not exceed 45dB L_{AFmax} in bedrooms at night.

2.1.9 In respect of external noise on balconies or in gardens, BS 8233 states that '*it is desirable that steady noise levels do not exceed 50 dB $L_{Aeq,T}$ dB and 55 dB $L_{Aeq,T}$ should be regarded as the upper limit'*.

2.1.10 The guidance contained within BS 8233 is identical to that presented in the WHO guidelines in terms of internal noise levels and, therefore, the recommended internal noise levels above have been used as the basis of the following assessment, to ensure that any proposed residential dwellings in areas categorised in NEC B, are afforded a commensurate level of protection against noise.

3.0 EXISTING NOISE CONDITIONS

3.1 SITE DESCRIPTION

3.1.1 There are no existing buildings on the 'Roundwood' site which is located within a larger area of woodland known as Walderslade Woods. The site currently consists of large wooded areas around the perimeter of the site with several clearings towards the central areas. The local topography of the site varies significantly, particularly where woodland has been previously cleared. In order to assist with the description, the site has been discussed in terms of varying ground heights (A to E), as shown on Figure 1.

3.1.2 To the north, the site is bounded by a row of semi detached properties accessed off Boxley Road. To the west, Walderslade Woods and to the east, is the residential development off Wildfell Close. Walderslade Woods Road forms the southern site boundary of the site with the M2 beyond.

3.1.3 The site slopes up, dramatically in places, from Walderslade Woods Road, with the exception of the area off Wildfell Close which drops down suddenly where it has previously been cut into the ground. The wooded areas to the north slope gently away. Walderslade Woods Road is approximately 2m above ground height along the edge of site 'A' at its eastern most edge, as the ground height of the site steps up to the west (sites 'B' and 'E'), Walderslade Woods road goes into cutting. The M2 is elevated above the eastern end of the site becoming at grade towards the central and western parts of the site.

3.1.4 Road traffic noise on Walderslade Woods and the M2 are the dominant sources of noise in the area, with distant traffic on Boxley Road to the north of the site being audible during traffic lulls on these two roads and outside peak travel times.

3.1.5 Whilst the most exposed parts of the site are heavily influenced by road traffic noise, given the significant screening provided by the variation in local topography 'areas of tranquility' exist across the site.

3.2 NOISE SURVEY

3.2.1 An environmental noise survey has been undertaken by ENVIRON UK Ltd in order to determine the suitability of the site for residential development, commencing on 17th April 2007.

3.2.2 A combination of attended and unattended noise monitoring was undertaken at seven monitoring positions across the site, over a typical weekday period in order to establish existing noise levels across the site.

3.2.3 A description of the noise monitoring positions together with their corresponding grid references are detailed below and presented in Figure 1 of this report.

- Position 1 (site 'E') the highest point of the site – Grid Reference: TQ 76828, 61689. Unattended daytime and night-time measurements were undertaken at this position in order to determine the ambient noise levels at the most exposed boundary of the site. Attendance was undertaken during key times during the day and night to ensure that the measured noise levels could be attributed to the relevant sources of noise;

- Position 2 (site 'A') – Grid Reference: TQ 76990, 61658. Measurements were undertaken 4m from the kerbside of Walderslade Woods Road during both the daytime and night-time periods in order to determine roadside levels from this source;

- Position 3 (site 'A') – Grid Reference: TQ 76980, 61770. At this location, the site level is approximately 2m below the ground at measurement position 2; measurements were therefore undertaken to quantify the difference in noise level at this location;

- Position 4 & 5 (site 'B') - Grid References: TQ 76896, 61691 and TQ 76881, 61800. The site steps up significantly at these locations and therefore measurements were undertaken to determine the existing noise levels for this part of the site;

- Position 6 (site 'C') – Grid Reference: TQ 76794, 61855; Although the ground height at this location was the same as at positions 4 & 5 it was screened by road traffic noise on Walderslade Woods Road and the M2 it was screened by site E which is higher. As a result, the noise environment at this location was much quieter; and

- Position 7 (site 'D') - Grid Reference: TQ 76677, 61643. Although higher than site C, site D is also screened by site E and therefore measurements were undertaken at this location in order to determine representative noise levels.

3.2.4 A summary of the measurement results are given in Table 3 below for measurement positions 1 to 7. Full tabulated measurement results are presented in Technical Appendix B.

TABLE 3: SUMMARY OF RESULTS AND IDENTIFICATION OF NEC

Measurement Position	Period	Measured Noise Level, dB				
		$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{ASmax}	L_{AFmax}
1	Daytime	62	60	69	74	82
	Night-time	58	44	56	72	74
2	Daytime	53	50	55	60	65
	Night-time	52	48	54	63	66
3	Daytime	73	59	78	84	91
	Night-time	64	48	63	83	86
4	Daytime	57	51	59	65	68
5	Daytime	51	47	53	66	71
6	Daytime	47	43	49	57	59
7	Daytime	48	45	49	58	65

3.2.5 Measurements undertaken at Positions 1 and 3 were used to determine the contribution of road traffic noise from the M2 and Walderslade Woods Road respectively at the most exposed parts of the site to these respective noise sources.

4.0 NOISE IMPACT ASSESSMENT

4.1.1 An assessment of the suitability of the site for residential development has been carried out in accordance with the procedure described in PPG 24 and the requirements of MBC. For the purpose of assessing the suitability of the site for residential development, recorded measurement results ($L_{Aeq,T}$) for both the daytime (07:00 to 23:00 hours) and night-time (23:00 to 07:00 hours) periods have been compared with the noise levels corresponding to the Noise Exposure Categories for new dwellings set out in PPG 24 and presented in Table 1.

4.1.2 The daytime and night-time noise levels ($L_{Aeq,T}$) for assessment positions corresponding to the individual sections of the site are presented in Table 4, together with an indication of within which NEC each site falls. Given that the extent of the development is unknown at this stage, the NEC classification has been presented as a range across the site from the southern boundary to the northern boundary.

TABLE 4: ASSESSMENT POSITIONS AND IDENTIFICATION OF NEC

Site	Daytime	Night-time			NEC
	$L_{Aeq,16hr}$	$L_{Aeq,8hr}$	$L_{ASmax,8hr}$	$L_{AFmax,8hr}$	
A	67[1] - 53	64 - 52	77[1], 63	79[1], 66	C-B
B	57 - 51[2]	-	-	-	B-A
C	47[2]	-	-	-	A
D	48[2]	-	-	-	A
E	62 - 61[3]	58 - 57[3]	72 - 70[3]	74 - 72[3]	C-B

[1] This measurement has been corrected for distance to represent levels (first floor) at the northern most edge of the site.

[2] As these sites fall already fall within NEC A during the day, which is likely to be the noisiest period, night-time measurements were not undertaken .

[3] Given that Walderslade Woods road is in cutting at this location it has been assumed that the dominant source of noise at this location is from the M2. The measured level has therefore been corrected for distance to give the level of noise at the northern boundary of this site.

4.1.3 The recorded measurement results presented above show that the individual areas of the site are predicted to fall within NEC's A to C. The recorded L_{ASmax} levels did not exceed 82 dB at any time during the night-time period at ground floor or first floor heights and therefore the classification of the site will remain unchanged. However, further consideration has been given to the measured L_{AFmax} levels in accordance with the internal noise criterion of 45 dB L_{AFmax} given in BS 8233.

4.1.4 Where a site falls within NEC A, advice to local planning authorities is that '*Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as desirable'.*

4.1.5 For sites which are classified as NEC B, the advice to local planning authorities is that "*Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise*". And for sites falling within NEC C '*Planning permission should not normally be granted'.* Where planning permission is granted, measures will need to be implemented to ensure protection against noise.

4.1.6 In using PPG 24, however, it should be noted that the strict application of PPG 24 in considering the suitability of land for development does have limitations. This is specifically noted in the Ambient Noise Strategy, which relates specifically to London but is becoming increasingly relevant to other areas, which advises that '*Noise assessments carried out in accordance with PPG 24 will need to be used as pro-actively as possible'.*

4.1.7 Further limitations of PPG 24 are highlighted in the Association of London Government (ALG) response to ODPM consultation on PPG 24, which suggested that revision of PPG 24 should take account of the '*dynamic situation in London as increased intensity of land use develops*' and specifically, that '*PPG 24 must recognise that increasingly noise sensitive properties and noise sources cannot, practically, be segregated. Specifically, the point is made that many existing properties are within NEC C and D, and that a pragmatic approach to the application of PPG 24 is required'*. Early consultations on PPS 24, due to replace PPG 24, not yet issued, also support this approach through the proposed merger of NEC's B and C.

5.0 NOISE MITIGATION MEASURES

5.2.1 In respect of mitigation, PPG 24 offers the following appropriate advice: *'There are various ways to control noise or limit people's exposure to it through design. These design measures should be the minimum necessary and may include one or more of the following:*

- *engineering and building design; reducing noise at the point of generation (i.e. reducing traffic flows or low noise surfacing), containing noise (i.e. providing built barriers around a site), and protecting noise-sensitive buildings and areas (i.e. by improving sound insulation in these buildings and provision of purpose designed acoustic barriers); and*
- *layout design; for example, adequate distance between source and noise-sensitive building or area; screening by natural barriers, other buildings, non-critical rooms (i.e. garages or bathrooms), or elevations of a building.*

5.2.2 Where noise levels at the location of proposed residential dwellings cannot be reduced to an acceptable level with the windows open, PPG 24 states that '*because noise should be taken into consideration when determining planning applications in NEC B, it has been assumed that the minimum amelioration measure available to an occupant will be to close windows',*. In this instance, reference is made to other standards that establish suitable internal noise levels, such as BS 8233[4] and the WHO Guidelines for Community Noise[5].

5.2.3 This is considered to be a pragmatic approach; given the need for new housing, the fact that many proposed residential development sites across the UK fall within NEC B or above and that the approach is consistent with the policy adopted successfully across the vast majority of the UK.

5.2.4 In order to determine whether an adequate level of protection against noise will be afforded for future occupants of the proposed dwellings, the likely internal noise levels of the future dwellings can be calculated and compared with noise criteria recommended in BS 8223.

[4] British Standard 8223 (1999): Sound insulation and noise reduction for buildings – Code of Practice. British Standards Institute.
[5] World Health Organisation (1999): Guidelines for Community Noise, WHO

5.2.5 The glazing element of any building is generally the weakest part and therefore it is appropriate in the first instance to explore the level of protection that will be afforded by the performance of the glazing elements.

5.2.6 PPG 24 provides within its annexes a set of data relating to the typical noise reduction performance of a dwelling façade with different types of glazing units set in a brick / block wall. Figures are presented for a variety of different noise sources, and present the difference between the noise level measured immediately outside the window (i.e. at façade) and the level measured within the dwelling.

5.2.7 The sound reduction performance figures quoted in PPG 24 for road traffic noise, which is considered to be most appropriate in this instance, are detailed in Table 5 below, along with the level of sound reduction that would apply to the free-field noise levels measured.

TABLE 5: SOUND INSULATION PERFORMANCE OF DIFFERENT GLAZING TYPES FOR ROAD TRAFFIC NOISE, AS SET OUT IN PPG 24, dB(A)

Reduction Type	***Sound Insulation Performance dB(A)***		
	Well Sealed Single Glazing	***Thermal Double Glazing***	***Secondary Glazing***
façade	28	33	34
free-field	25	30	31

5.2.8 Assuming that all of the proposed dwellings will be constructed using thermal double glazing as standard, internal noise levels within the proposed dwellings would be approximately 30 dB(A) lower than the free-field noise level at the location of their front façade.

5.2.9 Tables 6 and 7 show the likely internal noise levels at the assessment positions used above during both the daytime and night-time positions.

TABLE 6: FREE-FIELD EXTERNAL DAYTIME NOISE LEVELS CORRESPONDING TO INTERNAL NOISE CRITERIA FOR FUTURE DWELLINGS (WINDOWS CLOSED) dB(A)			
Boundary Position	***External Façade Level***	***Equivalent Internal Level***	***Equivalent BS 8233 Criteria***
A	67	37	Between 'Good' and 'Reasonable'
B	57	27	Better than 'Good'
C	47	17	Better than 'Good'
D	48	18	Better than 'Good'
E	62	32	Between 'Good' and 'Reasonable'

TABLE 7: FREE-FIELD EXTERNAL NIGHT-TIME NOISE LEVELS CORRESPONDING TO INTERNAL NOISE CRITERIA FOR FUTURE DWELLINGS (WINDOWS CLOSED) dB(A)			
Boundary Position	***External Façade Level***	***Equivalent Internal Level***	***Equivalent BS 8233 Criteria***
A	64	34	Between 'Good' and 'Reasonable'
B	-	-	-
C	-	-	-
D	-	-	-
E	58	28	Better than 'Good'

5.2.10 The highest night-time L_{AFmax} noise levels of 76 dB and 74 dB were measured, based on a façade reduction of 30 dB, the internal L_{AFmax} noise criterion of 45 dB recommended in BS 8223 would be achieved.

5.2.11 However, the above calculations do not make any allowance for the incorporation of permanent ventilation to the dwellings. On ventilation, BS 8233 advises that:

"*The Building Regulations on ventilation recommend that habitable rooms in dwellings have background ventilation. Trickle ventilators can provide this, and sound attenuating types are available. Where sound insulation requirements preclude opening windows for rapid ventilation and cooling, acoustic ventilation units incorporating fans are available for insertion in external walls; these can provide sound reduction comparable with domestic secondary glazing*."

5.2.12 Where appropriate, the preferred choice of ventilation is through the use of natural ventilation openings such as trickle vents, air-bricks and passive ventilation devices. Such ventilators can be used to meet the requirements of the Building Regulations Approved Document F for background ventilation.

5.2.13 The Building Research Establishment (BRE) has published an Information Paper on the acoustic performance of such passive ventilation systems[6], detailing a study into the sound reduction performance of fourteen different window mounted trickle ventilators and seven different through-wall passive ventilators. The measured sound reduction performance, after taking into account flanking sound paths (i.e. sound paths that do not travel directly through the vent) and the effective area of the ventilator were 14 to 40 dB(A) for 'window mounted trickle vents' and 30 to 46 dB(A) for 'passive through wall ventilators'.

5.2.14 Trickle vents or passive through wall ventilators are available that meet the requirements of the Building Regulations Approved Document F for background ventilation and also provide a sound reduction performance that meets or exceeds that required from the glazing elements.

5.2.15 It is therefore recommended that ventilators with a sound reduction performance that is at least equivalent to that of the glazing system for each façade is used to prevent the sound insulation of the glazing being undermined by the ventilation of the buildings.

[6] IP4/99: 1999: Ventilators: Ventilation and Acoustic Effectiveness

6.0 CONCLUSIONS

6.1.1 ENVIRON UK Limited was commissioned by the Kent County Council Property Group to measure and assess the impact of noise in respect of the suitability of land known as 'Roundwood School', Boxley for residential development.

6.1.2 An environmental noise survey was undertaken commencing on 17 April 2007 in order to assess the suitability of the site for residential development in accordance with the procedure described in PPG 24 and the requirements of MBC.

6.1.3 The results of the assessment have shown that the most exposed boundaries of the site, adjacent to Walderslade Woods Road and the M2 fall within NEC C and B with all remaining parts of the site falling within NEC A.

6.1.4 Advice within PPG 24 for sites classified as NEC A is that "*noise need not be considered as a determining factor in granting planning permission*"; however, for sites which are classified as NEC B or above (excluding NEC D), noise should be taken into account and, where appropriate, conditions imposed to ensure an adequate level of protection against noise is afforded to future residents.

6.1.5 Further consideration has therefore been given to recommended internal noise criteria for future habitable rooms. With the use of thermal double glazing and passive ventilation systems there will be sufficient attenuation of external noise to meet the recommended internal noise criteria. Therefore, the assessment has concluded that residential dwellings could be constructed even at the most exposed boundaries of the site and still provide a commensurate level of protection against noise to the future occupants of the respective dwellings (in line with the requirements of BS 8233).

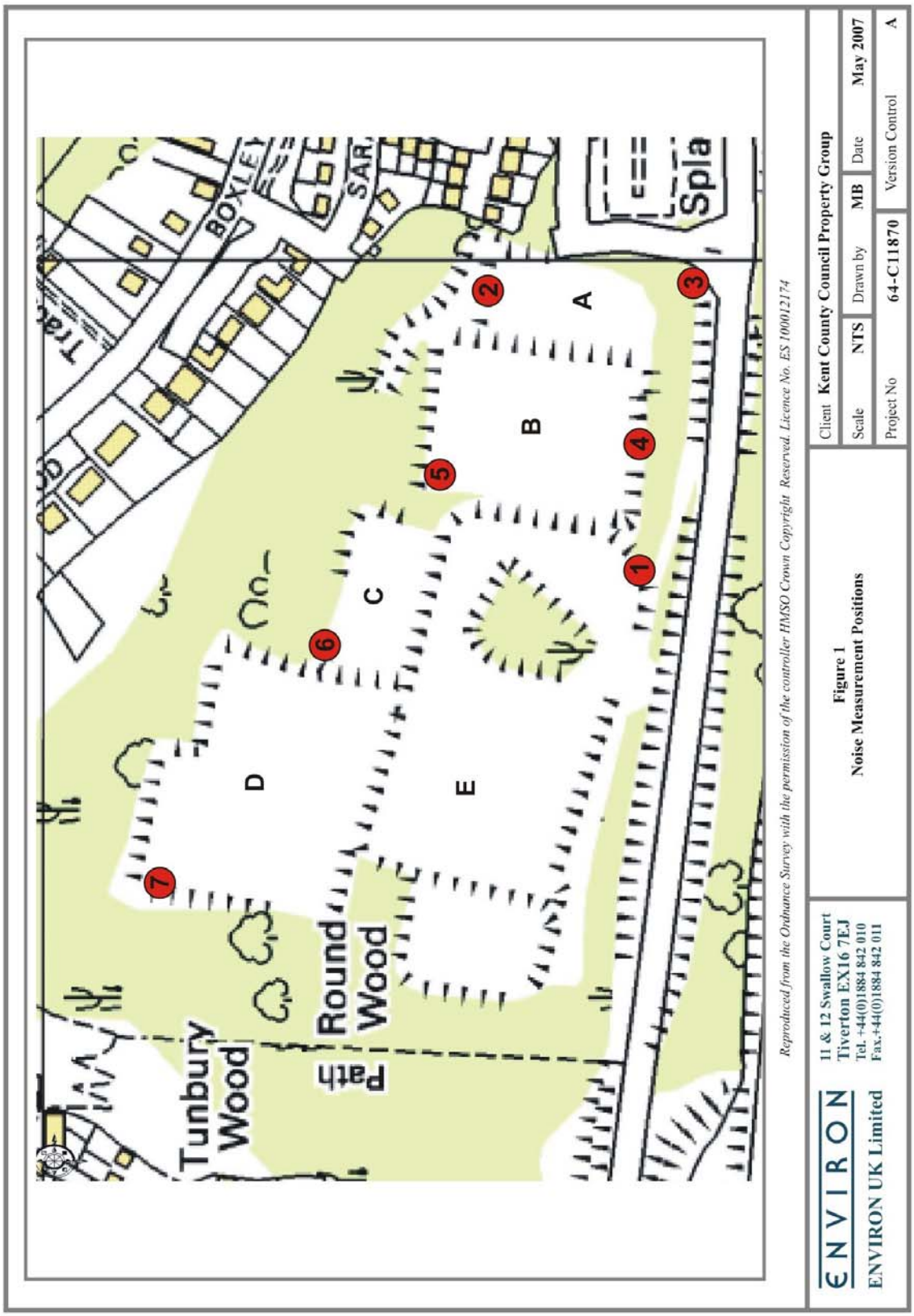
Tunbury Wood
Round Wood
Path
A
B
C
D
E
1
2
3
4
5
6
7
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Figure 1
Noise Measurement Positions
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TECHNICAL APPENDIX A – GLOSSARY OF ACOUSTIC TERMINOLOGY

TABLE A1: GLOSSARY OF ACOUSTIC TERMINOLOGY	
Terminology	**Definition**
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10-6 Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds S1 and S2 is given by 20 log10 (S1/S2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Fast Time Weighting	An averaging time used in sound level meters.
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).

TECHNICAL APPENDIX B – RECORDED MEASUREMENT RESULTS

Recorded measurement results for each of the measurement positions are presented in Tables B1, B2 and B3 respectively.

TABLE B1: RECORDED DAYTIME MEASUREMENT RESULTS - POSITION 1

Start Time	Duration	Measured Noise Level, dB				
		$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{ASmax}	L_{AFmax}
17/04/2007 23:00	30 minutes	58	52	62	72	74
17/04/2007 23:30	30 minutes	56	49	59	72	74
18/04/2007 00:00	30 minutes	55	46	59	68	69
18/04/2007 00:30	30 minutes	54	43	57	65	66
18/04/2007 01:00	30 minutes	53	43	57	68	69
18/04/2007 01:30	30 minutes	54	43	58	69	70
18/04/2007 02:00	30 minutes	54	44	57	68	69
18/04/2007 02:30	30 minutes	54	40	58	67	68
18/04/2007 03:00	30 minutes	53	40	57	65	66
18/04/2007 03:30	30 minutes	52	41	55	65	66
18/04/2007 04:00	30 minutes	55	44	58	69	71
18/04/2007 04:30	30 minutes	56	48	60	66	68
18/04/2007 05:00	30 minutes	60	52	64	70	72
18/04/2007 05:30	30 minutes	62	56	65	69	71
18/04/2007 06:00	30 minutes	63	56	66	69	71

TABLE B2: RECORDED NIGHT-TIME MEASUREMENT RESULTS - POSITION 1						
Start Time	**Duration**	**Measured Noise Level, dB**				
		$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{ASmax}	L_{AFmax}
18/04/2007 07:00	30 minutes	64	60	67	74	82
18/04/2007 07:30	30 minutes	65	61	67	70	71
18/04/2007 08:00	30 minutes	64	61	66	68	70
18/04/2007 08:30	30 minutes	64	60	66	68	69
18/04/2007 09:00	30 minutes	63	58	66	68	70
18/04/2007 09:30	30 minutes	62	57	65	69	72
18/04/2007 10:00	30 minutes	62	56	64	75	77
18/04/2007 10:45	30 minutes	59	54	62	68	76
18/04/2007 11:45	30 minutes	60	54	62	67	68
18/04/2007 12:45	30 minutes	60	54	62	65	67
17/04/2007 20:30	30 minutes	62	56	65	74	76
17/04/2007 21:00	30 minutes	62	56	65	70	72
17/04/2007 21:30	30 minutes	61	55	64	68	69
17/04/2007 22:00	30 minutes	60	54	63	70	72
17/04/2007 22:30	30 minutes	59	51	62	70	71

TABLE B3: RECORDED DAYTIME AND NIGHT-TIME MEASUREMENT RESULTS - POSITION 2						
Start Time	**Duration**	**Measured Noise Level, dB**				
		$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{ASmax}	L_{AFmax}
18/04/2007 12:18	15 minutes	53	50	55	60	65
18/04/2007 12:33	15 minutes	54	51	55	56	59
18/04/2007 10:45	5 minutes	51	46	55	58	59
17/04/2007 23:00	5 minutes	51	47	54	59	60
17/04/2007 23:06	5 minutes	53	48	55	62	63
18/04/2007 12:18	5 minutes	52	48	54	57	58
17/04/2007 23:38	5 minutes	53	49	55	63	64
18/04/2007 12:36	5 minutes	52	48	54	63	66

TABLE B4: RECORDED DAYTIME AND NIGHT-TIME MEASUREMENT RESULTS - POSITION 3						
Start Time	**Duration**	**Measured Noise Level, dB**				
		$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{ASmax}	L_{AFmax}
18/04/2007 12:36	15 minutes	73	59	77	82	84
18/04/2007 12:51	15 minutes	73	59	77	84	91
18/04/2007 13:06	15 minutes	74	58	78	82	84
17/04/2007 23:38	5 minutes	63	49	62	79	81
17/04/2007 23:43	5 minutes	64	49	66	79	81
17/04/2007 23:48	5 minutes	62	49	61	79	81
17/04/2007 23:53	5 minutes	65	47	65	80	83
17/04/2007 23:58	5 minutes	65	46	59	83	86
18/04/2007 00:03	5 minutes	64	46	65	78	81
18/04/2007 00:08	5 minutes	56	44	61	65	67

TABLE B5: RECORDED DAYTIME TIME MEASUREMENT RESULTS - POSITION 4						
Start Time	**Duration**	**Measured Noise Level, dB**				
		$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{ASmax}	L_{AFmax}
18/04/2007 11:15	15 minutes	57	51	59	65	68
18/04/2007 11:30	15 minutes	54	49	59	59	67

TABLE B6: RECORDED DAYTIME TIME MEASUREMENT RESULTS - POSITION 5						
Start Time	**Duration**	**Measured Noise Level, dB**				
		$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{ASmax}	L_{AFmax}
18/04/2007 10:53	15 minutes	51	47	53	64	66
18/04/2007 11:08	15 minutes	52	46	55	66	71

TABLE B7: RECORDED DAYTIME TIME MEASUREMENT RESULTS – POSITION 6						
Start Time	**Duration**	**Measured Noise Level, dB**				
		$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{ASmax}	L_{AFmax}
18/04/2007 11:36	15 minutes	47	43	49	57	59
18/04/2007 11:51	15 minutes	47	47	47	48	49

TABLE B8: RECORDED DAYTIME TIME MEASUREMENT RESULTS - POSITION 7						
Start Time	**Duration**	**Measured Noise Level, dB**				
		$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{ASmax}	L_{AFmax}
18/04/2007 11:56	15 minutes	48	45	49	58	61
18/04/2007 12:11	15 minutes	47	45	47	57	65